

**Title** Ozone fumigation of stored grain; closed-loop recirculation and the rate of ozone consumption

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#### **Abstract**

Research using ozone gas as a fumigant has shown promise in controlling stored-grain insect pests. In addition to being toxic to insects, ozone gas is unstable and decays naturally into diatomic oxygen and must be continually replenished to maintain entomologically lethal concentrations in the grain mass. This two-part study quantifies the rate of ozone gas decay encountered in typical grain storage environments. From this, ozone generation capacity can be modeled. A pilot study was conducted in a commercial steel grain bin filled with 13.6 tonnes of hard red winter wheat. The bin was equipped with a closed-loop recirculation system to capture and reuse ozone gas that had passed through the grain. A second laboratory study was conducted on 55 kg samples of wheat and corn to determine the rate of ozone decay in different grains at different fumigation temperatures. With previously untreated grain samples, initial ozone decay is high. After a passivation period that ranged from 53.5 to 84.7 h, the decay rate reached a steady state. The half-life of ozone ranged from 122 s in grade 4 wheat with high foreign matter content, to 242 s in grade 2 wheat. Results show that the rate of ozone decay in wheat and corn was not significantly affected by temperature in the range in which fumigations are typically undertaken.